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The Gender Wage Gap and Discrimination, East Germany 1990–1997

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Summary

East Germany has undergone rapid transition from a socialist to a market economy since the fall of the Berlin Wall. We are interested in whether women are better off or worse off relative to men as a result of this transition. We use the German Socio-Economic Panel Data 1990–1997 to study wage determination and we implement a decomposition analysis that accounts for selection bias issues. Our analysis shows that even though the gender wage gap is shrinking, gender discrimination is not.

1. Introduction

Since the fall of the Berlin Wall on November 9, 1989, East Germany has undergone a series of dramatic and far-reaching changes — economically, politically and demographically — in its transformation from a socialist to a market economy. These changes have had important implications for the economic status and behavior of women, especially relative to the status and behavior of men.

The rhetoric of socialist ideology promoted egalitarian social policy — East Germans possessed a constitutional right to work, tenure in jobs, welfare and social entitlements such as housing and childcare, and compressed wage scales. As a result of these types of policies, prior to 1990 one would expect that gender differences in wages would be small in East Germany. However, even with high female labor force participation and equal pay for equal work, other gender differences can exist. An extreme form of the internal labor market persisted in East Germany; there was little mobility between enterprises. New labor market entrants were channeled by their educational institutions into their first jobs, where they were expected to stay. These labor market characteristics leave ample room for discriminatory behavior to persist. Indeed, women were disproportionately in the service sector, in low or semi-skilled jobs, typically working in "women's jobs" such as retail trade (Lange and Pugh 1998; Braun, Jasper, and Schröter 1995).

Our basic concern in this paper is whether women are better off or worse off relative to men as a result of East Germany's transition from a socialist to a market economy. In our analysis of the gender wage gap we explore the underlying causes of the economic progress of women relative to men along a number of dimensions over the course of the transition: 1) How much of the wage gap is explained by discrimination, that is, differences in the returns to the same characteristics?; 2) How much of the wage gap is explained by differences in the levels of explanatory characteristics possessed by men and women?; and 3) How much of the wage gap is explained by unobserved characteristics and their returns?

A number of prominent scholars have described changes in East Germany (Bird, Schwarze, and Wagner 1994; Braun, Jasper, and Schröter 1995; Lange and Pugh 1998), extended gender gap and decomposition theory (Altonji and Blank 1999; Neuman and Oaxaca 1998; Yun 2000), and analyzed various aspects of the gender wage gap in East Germany (Abraham and Houseman 1995; Hunt 1999; Krueger and Pischke 1995).

It is well recognized that it is important to account for selection bias in understanding changes in the gender wage gap. Even though men and women are observed to have the same levels of human capital, they may have different levels of unobserved earnings power (sometimes referred to in the literature as *ability*). If women have more unobserved earning power than men due to a different pattern of selection into the labor market, then failing to take account of selection will underestimate "true" discrimination. In wage equations, differences in the estimated coefficients between men and women, showing different rates of return to the same characteristics, is referred to as *discrimination*. Thus, if selection issues are not accounted for, the estimate of discrimination may be biased and misleading. In order to take account of the different patterns of selection into the labor market, we adopt a generalized Tobit framework, which simultaneously estimates wages, hours, and working equations (Mroz 1987; Zabel 1993). We employ maximum likelihood to obtain consistent estimates and, in order to analyze the gender gap in wages using the MLE estimates, we implement a new decomposition method that requires only that the estimates of wages be consistent (see Yun 2000 for details).

In the next section we describe the data and major trends in male-female wage ratios from 1990 to 1970. In Section 3 we discuss our methodology. We review our decomposition results in Section 4. Section 5 concludes.

2. The Data and the Gaps

We employ the 1990 to 1997 waves of the German Socioeconomic Panel (GSOEP), a comprehensive panel of

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household and individual data.[1] Collection in East Germany began in May 1990. We restrict our sample to individuals aged 20 to 65 who have completed their education (including formal occupational training), who earn real wages (in 1995 DM) of less than 100DM per hour, and who work less than 100 hours per week. We exclude those who are self-employed, on maternity leave, in agriculture, or who were originally in the sample but moved from East to West Germany.

Between 1990 and 1997 the percentage of those aged 20 to 65 who were working dropped by 16.7 percent for men and 11.9 percent for women. Hours of work for men increased by 1.7 percent and 1.0 percent for women. Real hourly wages (gross income /(hours per week *4.3)) increased by 122.3 percent for men and 147.7 percent for women.

Table 1 lists hourly wages of both men and women. The last row of the table shows the change in these numbers from 1990 to 1997. Real wages of men more than doubled, but wage growth was even more rapid among women. Real wages of women went up almost 2-1/2 times over these eight years. In 1990, the typical East German women earned 6.92 DM per hour; by 1998 she earned 17.14 DM per hour. The pace for wage gains for both men and women was far from uniform; the most dramatic percentage gains were from 1990 to 1993. As described by Krueger and Pischke (1995) this dramatic increase in real wages was due to the aggressiveness of West German unions in organizing East German workers, to the attempt to achieve some sort of parity with the West, and the lack of resistance of the managers of East German firms to significant increases in workers' wages.

Table 1

Mean Hourly Wages by Gender and the Gender Gaps

Year	Men	Women	Gap Percent
1990	8.11 (2.69)	6.92 (2.59)	17.2
1991	11.96 (6.21)	9.72 (4.16)	23.0
1992	13.38 (5.37)	12.06 (5.31)	11.0
1993	15.44 (6.81)	14.54 (7.25)	6.2
1994	17.31 (8.01)	15.97 (7.20)	8.4
1995	17.12 (7.13)	16.52 (8.39)	3.6
1996	17.98 (7.35)	17.05 (6.92)	5.4
1997	18.03 (7.56)	17.14 (7.56)	5.2
Percentage Change from 1990 to 1997	122.3	147.7	–12.0

[a] Gap is percentage advantage enjoyed by men. Constant 1995 DM, standard deviations in parentheses.

Sources: GSOEP East German sample, 1990–97. Included here are men and women aged 20 to 65, with real wages (in 1995 DM) less than 100DM per hour, working less than 100 hours per week, who are not in school, training, self-employed, on maternity leave, or in agriculture. Also excluded are people who moved from East to West Germany.

While the standard of living of East German males has gone up since 1990, the standard of living of East German women has improved not only measured against their recent past, but relative to their male contemporaries. The wage gap in 1997 was only 5.2 percent, which is far below that of western industrialized countries, including West Germany. This decrease in the gap is surprising. One would expect the integration of socialist East Germany into the market economy of West Germany to increase the gender wage gap. We try to explain the shrinking of the gender wage gap in East Germany.

3. Methodological Issues

We are interested in whether the transition after German reunification equally benefited both men and women of East Germany. We approach this issue by analyzing gender wage gap using the well-known Blinder-Oaxaca type decomposition equation.

As the basis of the decomposition analysis, we jointly estimate log-wages, log-hours, and binary choice of labor market participation, in order to take account of selection issues:

$$\ln W = Z\gamma + v, \tag{1}$$

$$\ln H = \alpha \ln W + X\beta + \delta N + u, \tag{2}$$

$$P^* = Q\theta + e, \tag{3}$$

where the dependent variables in equations (1), (2), and (3) are log-wages (hourly), log-hours, and a latent variable for participation, respectively; Z, X, and Q are exogenous variables; and N is non-labor income (measured as family income minus respondent's income).

Individuals will participate (P = 1) when P^* is positive; they will not participate (P = 0) otherwise.[2] The wages and

[1] We use the international version of the GSOEP, which is a 95 percent sample of the German version. For a full description, see *http://www.diw.de/soep/soepe.htm.*

[2] Participation is usually defined to include employment and unemployment. However, most studies of labor supply do not count unemployment in the definition of participation. In other words, unemployment is treated as equivalent to leisure or non-employment. Therefore, we also treat unemployment as non-participation to keep the analysis simple.

hours of work are observed for those who participate in the labor market but are missing for those who do not. This model is known as the "generalized Tobit model."

We estimate all three equations jointly using the maximum likelihood method. The likelihood function is,

$$L = \prod \Pr(\ln W,\ \ln H,\ P^* > 0)^P \Pr(P^* \le 0)^{1-P}. \qquad (4)$$

The likelihood function can be easily evaluated by assuming joint normality of the stochastic terms (v, u, e). The joint probability of labor market participants (P = 1) can be estimated by using the marginal and conditional densities. That is,

$$\Pr(\ln W,\ \ln H,\ P^* > 0) = \Pr(P^* > 0 \,|\ln W,\ \ln H)\ \Pr(\ln H \,|\ln W)\ \Pr(\ln W),$$

which can be quickly evaluated.

By maximizing the likelihood function, we obtain consistent estimators for wages (γ) and hours (α, β, and δ), participation choice (θ), and variance and correlation coefficients.[3] The estimation is implemented using the SAS non-linear programming (NLP) procedure.

The estimates obtained by maximizing the likelihood function are used in a Blinder-Oaxaca type decomposition equation. A large number of papers have discussed how to revise the decomposition equation when selection issues exist (e.g., Neuman and Oaxaca 1998). However, previous papers have been restricted to the use of Heckman's two-step estimation method. Recently, Yun (2000) devised a general method for the Blinder-Oaxaca decomposition equation when there are selection issues. The generalization enables us to use consistent estimates obtained from maximizing the likelihood function.

When selection issues are present, men and women may have different distributions of unobserved individual characteristics (stochastic components) in wages. We assume that both groups have the same distribution of unobserved individual characteristics in order to identify wage differentials due to differences in "observed" individual characteristics and differences in their coefficients.

We apply the Blinder-Oaxaca decomposition methodology for wage differentials predicted by the observed individual characteristics and coefficients, after restricting the mean of the error term to zero. The final decomposition equation for log-wages for a given time period is

$$\overline{\ln W}_m - \overline{\ln W}_w = \Delta\overline{Z}\,\tilde{\gamma}_w + \overline{Z}_m\Delta\tilde{\gamma} + \Delta\overline{\tilde{\Lambda}}, \qquad (5)$$

where $\overline{\ln W}$, $\overline{Z}$, and $\tilde{g}$ are sample average of log-wages, independent variables, and consistent estimates from the maximum likelihood estimation, respectively. Subscripts m and w represent men and women, respectively; Δ represents the difference between men and women; and $\Delta\overline{\tilde{\Lambda}}$ is the difference in the sample average of residuals ($\tilde{v} = \ln W - Z\tilde{g}$) between men and women. The wage gap is decomposed into three parts: one is explained by a difference in observed individual characteristics ($\Delta\overline{Z}\,\tilde{g}_w$), the second is explained by differences in coefficients on observed characteristics ($\overline{Z}_m\Delta\tilde{g}$), and the third is explained by selection effects caused by differences in unobserved individual characteristics and their returns ($\Delta\overline{\tilde{\Lambda}}$).[4]

4. Analysis

Figure 1 presents the decomposition results for the gender wage gap, year by year. Lying behind our decomposition calculations are consistent estimates of the coefficients, obtained by employing maximum likelihood to estimate a generalized Tobit, correcting for selection bias, as described in the previous section.[5]

As discussed in reference to Table 1 above, the gender wage gap has been declining, falling from approximately 15 to 20 log-points in 1990–1991 to a little more than 6 log-points in 1997.[6] Most of this gain on the part of women occurred by 1993. Our decomposition, however, reveals some deeper changes. The part of the gap explained by the differences in observed individual characteristics effect indicates an advantage to women — if men and women had the same rate of return to their characteristics, women would have the wage advantage, and this advantage would be increasing over the transition period. This raises the counterfactual issue: what if men and women had the same characteristics? Our decomposition tells us that the wage gap would be even bigger than it is, because then the wage gap would be reflecting only discrimination, which is quite high here. In fact, our differences in coefficients effect (conventionally interpreted as discrimination; sometimes called the price effect) falls in the early years of transition (though it is still positive), and rises since 1992. If there were no discrimination, the wage gap would fall and reflect the differences in observed individual characteristics — men would get lower wages than women. Of particular note here is the selection effect, the

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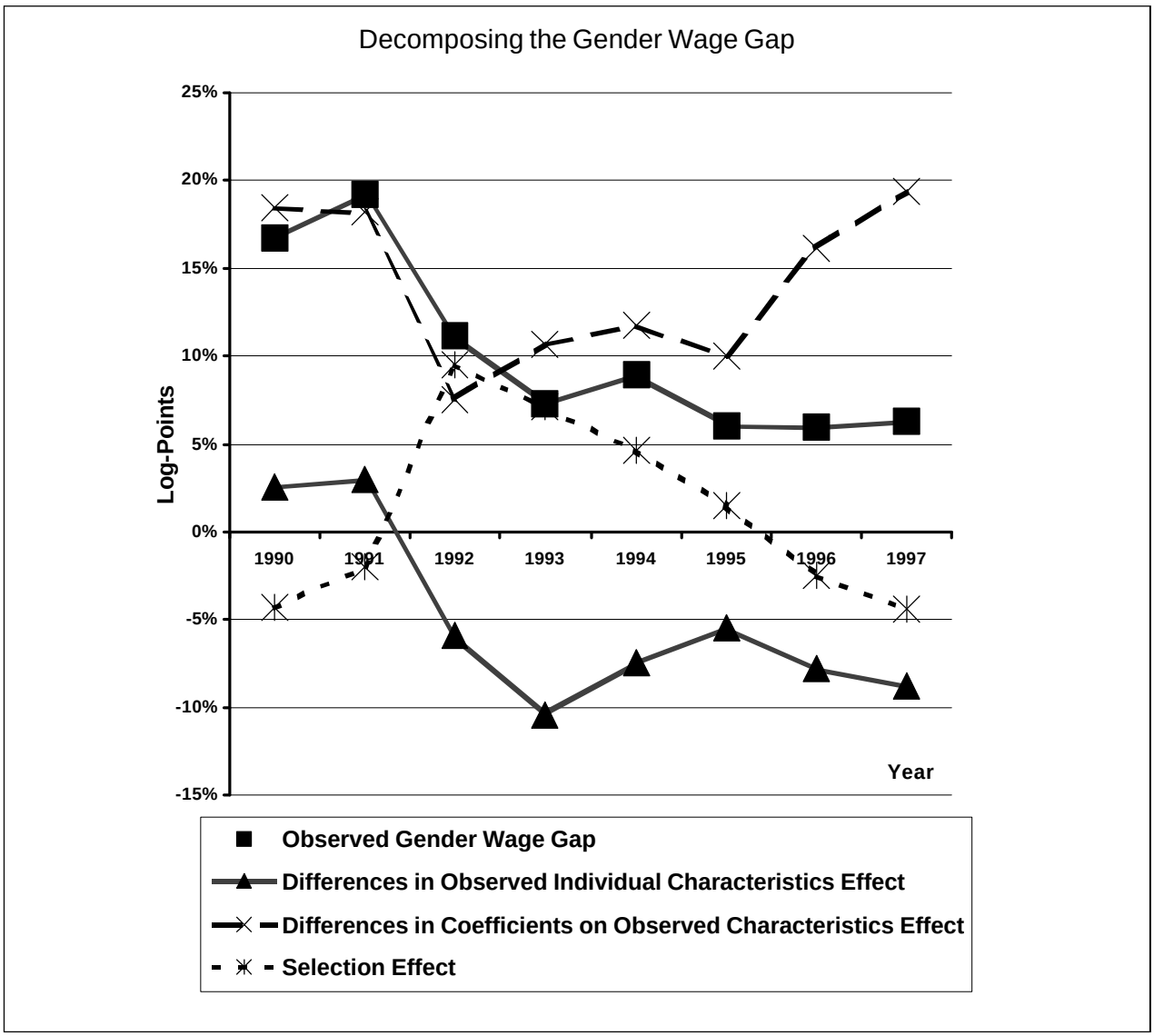
[3] For identification purposes, the variance of e is normalized to 1.

[4] The decomposition equation presented here is not unique. The results of other formulations are available from the authors.

[5] These estimates are available from the authors on request. The wage equation includes experience (potential years employed) and experience-squared, education (combined years of schooling and official training programs), type of occupation, firm size, and region. The hours worked equation includes age and age-squared, education, family size, the number of children under age 16, a health measure, the log of wages, and non-labor income. The participation equation includes: age and age-squared, education, marital status, the number of children under age 6, the number of children older than 5 and younger than 16, non-labor income, mother's education, and father's education.

[6] Table 1 reports percentage wage differentials. We use log-points in the remaining discussion, because they are quite similar to the percentage differentials.



effect caused by the differences in unobserved characteristics and the returns to them. In 1990 and 1991 this effect mildly favored women, serving to reduce the wage gap. However, from 1992 to 1995, the selection effect served to widen the gender wage gap in favor of men. Again in 1996 and 1997, the selection effect moved in favor of women.

It is important to note, that though the overall gender gap has leveled off at about 6 log-points, discrimination is increasing. Our estimate of “discrimination” in 1997 is 20 log-points.

5. Conclusions

We examine how the gender wage gap has changed during the course of transition for East Germany, using the German Socio-Economic Panel Data from 1990 to 1997. We estimate wages, using maximum likelihood, and apply a generalized Tobit model that accounts for selection in hours and participation. This provides us with a set of consistent estimates. With these we construct a Blinder-Oaxaca type decomposition, in particular accounting for the presence of selection effects.

What is the bottom line? The raw numbers indicate a rather startling decrease in the gender wage gap to a level seen in very few economies, whatever their economic system. However, the decomposition analysis, using coefficients that have taken into account selection issues, shows something quite different. While discrimination decreased from 1990 to 1992, since 1992 it has risen, reaching almost 20 log-points in 1997.

Our story is incomplete: we have focused on the gender wage gap, which only tells us what is happening to the

employed. The transition process also affected labor participation rates and the number of hours worked by men and women. If we want to investigate the effects of economic transition on the gender gap in the labor market as a whole, we must consider these other two aspects. In other work we do this, and we also look at the changing structure of female earnings during transition (Gang and Yun 2000).

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